NOTES ON THE BIOLOGY AND DISTRIBUTION OF *TRAPEZITES TAORI* ATKINS (LEPIDOPTERA: HESPERIIDAE)

STEPHEN J. JOHNSON[1] and PETER S. VALENTINE[2]

[1]*Oonoonba Veterinary Laboratory, PO Box 1085, Townsville, Qld. 4810*

[2]*Tropical Environment Studies & Geography, James Cook University, Townsville, Qld. 4811*

Abstract

Trapezites taori Atkins is recorded breeding on *Lomandra confertifolia pallida* A.T. Lee (Xanthorrhoeaceae) growing along sandstone cliffs and escarpments at Blackdown Tableland National Park and at a new southern location for the butterfly in Carnarvon Gorge National Park, Queensland. A description is given of the previously unknown pupa and comments are made on the apparent close association between *T. taori,* its foodplant and the sandstone habitat of central Queensland.

Introduction

Trapezites taori Atkins was described from a series of both sexes collected at Blackdown Tableland and a single female from Isla Gorge, central Queensland (Atkins 1997). Eggs were obtained from captive females, enabling descriptions of early immature stages, but rearing beyond larval stage was not achieved (Atkins 1997). The captive larvae fed on several *Lomandra* spp. but immature stages were not located in the field.

T. taori has a limited distribution with adults regarded as rare (Atkins 1997, Braby 2000) and National Parks staff in the areas where the skipper was known to occur were keen to develop conservation management plans for it. We undertook work on the biology and distribution of *T. taori* in order to provide data on which to formulate conservation plans and the preliminary findings of these studies are presented here.

Life history and habitat

Adult males were observed in September and October 2000 at Blackdown Tableland, establishing leks in small clearings close to the edge of the sandstone escarpment, where they settled on low bushes, twigs or directly on the sandstone where the underside colour provided excellent crypsis. A male was subsequently observed patrolling a lek close to the base of the cliff in March 2003. On two occasions adults were observed to enter the area along the top of the escarpment by flying up the face of the escarpment. We could find no larvae or evidence of larval feeding on any of the several *Lomandra* spp. that grew in the heath or forest areas on the adjacent tableland.

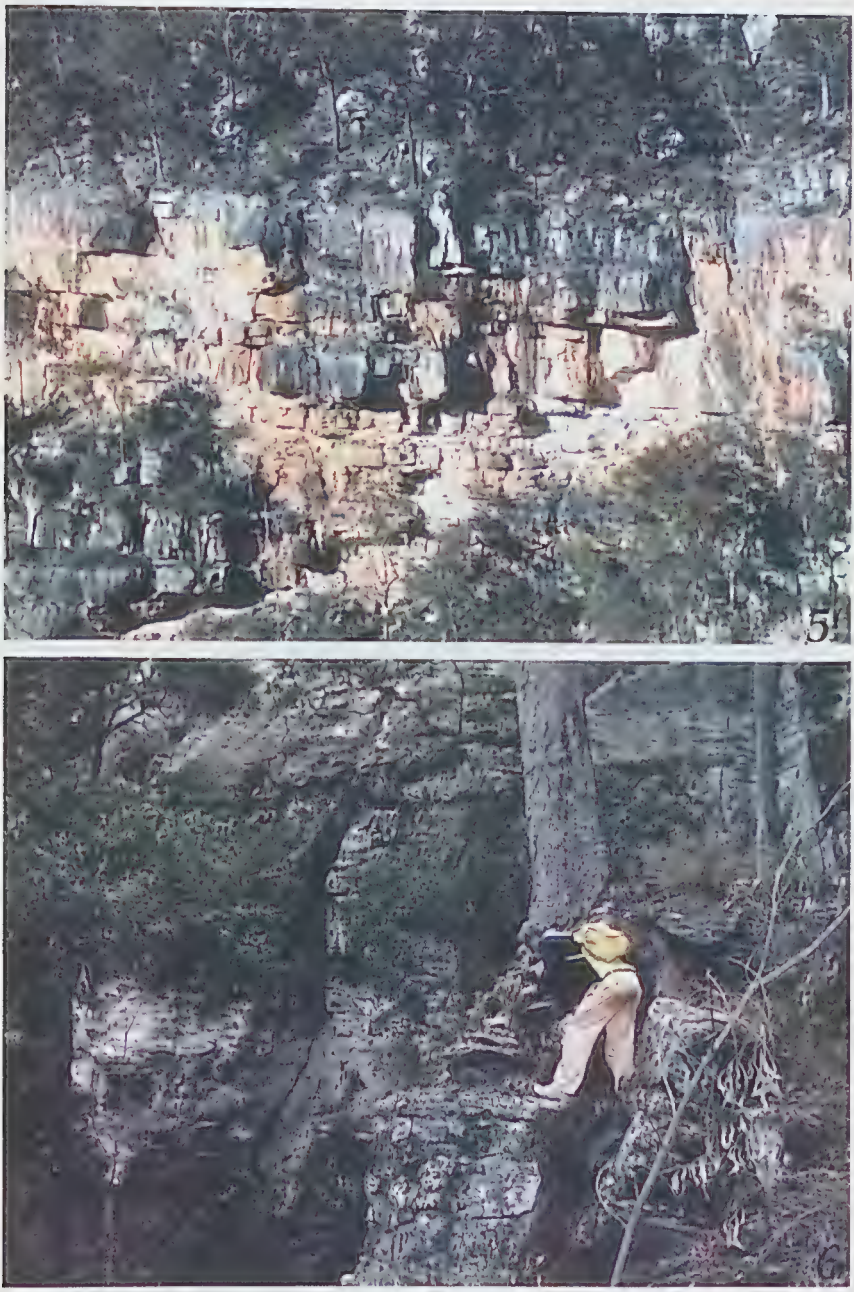
In February 2001, we searched the broken edge along the top of the escarpment and located numerous fine-leaved *Lomandra* plants. A small, unidentified *Trapezites* Hübner larva was found in a curled dead leaf within one of the plants. The following day we searched down to the base of the cliffs and found the same *Lomandra* species growing commonly in cracks, along ledges and in the broken scree at the base.

Several final instar larvae fitting the description of *T. taori* and numerous earlier instar larvae similar to the one found the previous day were found on these plants. The larvae were taken to Townsville for closer examination and all were consistent with the published description of *T. taori* larvae. The plants were subsequently identified as *Lomandra confertifolia pallida* A.T. Lee (Xanthorrhoeaceae) by the Queensland Herbarium.

The larvae were placed on potted *Lomandra* plants in Townsville. Final instar larvae pupated and emerged in March and April but the earlier instar larvae continued to feed and emerged in August and September.

In this habitat, *L .c. pallida* differs from other *Lomandra* spp. in having long, very fine leaves growing from elongated stems with the dead foliage recurved against the stem to form dense clumps. The plants were restricted to exposed sandstone areas such as ledges (Fig. 1), cracks and crevices in the vertical walls, in the broken scree at the base of the cliffs and occasionally extending down water lines.

Figs 1-4. Host plant and pupa of *Trapezites taori*. (1) typical *Lomandra confertifolia pallida* host plant in crevice at Blackdown Tableland; (2) mature larval head of *T. taori* (arrowed) and seed capsules of host plant at Carnarvon Gorge; (3) pupa, anterior view; (4) pupa, lateral view.



Figs 5-6. Habitat of *Trapezites taori*. (5) Precipice sandstone formation at Blackdown Tableland; (6) *L. c. pallida* host plant on ledge at Carnarvon Gorge.

All areas that contained *L. c. pallida* appeared to be protected from fires and the plants were absent from sections of the escarpment where adjacent forest and grasses grew close to the exposed cliff and allowed fire to penetrate.

Early instar larvae sheltered between leaves of the food plant. Later instars commonly constructed elongated shelters in the recurved dead leaves, with the entrance of the shelter opening at the base of the growing leaves and flower spikes, or made shelters in leaf litter where available. In the absence of fires the dead foliage remained in place for long periods and final instar larval and pupal shelters from previous generations were commonly encountered.

L. c. pallida produces short flower spikes that give rise to 3-4 large seeds that lie at the base of the growing leaves. Each seed has a striped pattern similar to that of the later instar larval heads of *T. taori.* In instances where the later larval shelter was constructed with the opening at the level of the seeds, the mature larvae rested with the head fully exposed and blocking the entrance to the shelter (Fig. 2) and the exposed head capsule was often difficult to distinguish from the seeds of the plant.

The previously undescribed pupa of *T. taori* (Figs 3-4) is 23-27 mm long and cylindrical, tapering posteriorly to an elongate decurved cremaster. It is pale grey-brown covered with black spots and blotches. The frons has two raised areas centrally and dorsally, the latter overlaid with black blotches. A transverse black line lies across the frons at the base of the central raised areas. The prothoracic plates are black and black spots form broken transverse lines on the posterior of the abdominal segments. The cremaster is dark brown with a deep pit ventrolaterally at the junction with the final abdominal segment. Prominent black stripes overly the antennal clubs ventrally.

Discussion

We visited Carnarvon Gorge, Isla Gorge and Blackdown Tableland in late August 2002 to search for additional locations for *T. taori.*

At Carnarvon Gorge our searches were confined to the bottom of the gorges. *L. c. pallida* was found predominantly along the scree slope but occasionally on ledges (Fig. 6) and cracks in the cliffs. Larvae of *T. taori* were found throughout the gorges of Carnarvon Creek and its tributaries. *L. c. pallida* at Carnarvon Gorge was morphologically different from that occurring at Blackdown Tableland and Isla Gorge in having broader leaves and shorter stems.

The habitat at Carnarvon Gorge is much wetter than either Blackdown Tableland or Isla Gorge and the scree at the base of the cliffs is deep sandy soil that supports tall forest but few understorey plants. The *Lomandra* plants were restricted to the exposed cliffs and the steep scree close to the base of the cliffs and did not extend into areas supporting grasses that carried

frequent fires. The overlying forest produced deep leaf litter and later instar larvae commonly made shelters in fallen leaves. Occasional larvae of *T. eliena* (Hewitson) were also found on *L. c. pallida* at Carnarvon Gorge.

At Isla Gorge almost all the accessible *L. c. pallida* plants had been burnt in September 2001 and only a single larva of *T. eliena* was found on a regrowth plant.

At Blackdown Tableland, larvae were found in the same situations as in summer. Several later larval instar shelters contained pupal exuviae of ichneumonid wasps. Larvae from both locations were placed on potted plants in Townsville and produced adults in September, October, November, December and January.

The high numbers of larvae found at Carnarvon Gorge and Blackdown Tableland suggest that the species is likely to be more abundant than previously thought.

The underside colour of adult *T. taori* closely resembles the exposed sandstone, suggesting a close evolutionary association between the skipper and exposed sandstone habitat. *L. c. pallida* is a widespread plant in southern Queensland (Henderson 1997), but in the sandstone habitats of central Queensland it appears to be the only *Lomandra* species that has adapted to growth in the narrow ecotone along the exposed sandstone cliffs. This restricted occurrence appears to be fire related and although the plant can survive occasional intense fires it appears to be intolerant of more frequent fires, being replaced by other *Lomandra* species in areas subject to more regular burning away from the rocky areas. The remarkable similarity between the seeds of *L. c. pallida* and the later larval head capsules of *T. taori*, together with the unusual habit of many larvae in constructing shelters opening at the level of the seeds and blocking the entrance of the shelter with their heads, further supports a long evolutionary association between *T. taori* and *L. c. pallida*.

Our findings to date indicate that the primary habitat of *T. taori* is a narrow ecotone less than 100 m wide along the cliffs and escarpments of the aptly named Precipice Sandstone Formation in central Queensland (Fig. 5). This Jurassic sandstone is exposed in a significant linear expression from Carnarvon Range through Lonesome National Park and Robinson National Park and connects to the north and east with Isla Gorge National Park. Although the main geological formation at Blackdown Tableland is Clematis Sandstone (which links Dawson, Shotover and Expedition Ranges), the cliff lines and gorges are Precipice Sandstone (Warner 1987). Other sandstone formations overlay the Precipice Sandstone, but this formation typically caps the mesas in Carnarvon Gorge and forms the walls of Carnarvon Range (Beetson and Gray 1993).

Throughout the sandstone environments there are numerous narrow but tall outcrops providing a maze of cliff lines that provide habitat for *L. c. pallida*. The dense dendritic drainage patterns further enlarge the linear component of this habitat.

Although the Precipice Sandstone Formation occurs as a thin zigzag line approximately 500 km from west to east, the major cliff outcrops are in the areas previously noted. In an attempt to estimate the length of suitable habitat (*ie*. outcropping sandstone cliff faces), we utilised the 1:250,000 topographic map sheets that cover the region and attempted to track the cliff lines by opisometer. Although clearly subject to errors of measurement and mapping, this revealed at least 1,000 km of cliffs. Blackdown Tableland was estimated to have 100 km of cliffs; Carnarvon Ranges west of the Injune to Rolleston Highway about 300 km; east of this highway down through Lonesome National Park and then east to Precipice Creek (type locality for the formation) includes another 300 km of cliffs; finally the Robinson Gorge National Park and north to Claire Range and Expedition Range includes a further 300 km.

The close association between the skipper, food plant and exposed sandstone habitat suggests that female *T. taori* may be unlikely to disperse far from exposed sandstone cliffs and raises the possibility of limited genetic interchange between populations in the more disjunct sandstone areas. There are a few small outliers disjunct from the main areas, including Isla Gorge which is 50 km away from its nearest neighbour outcrop. The Blackdown Tableland outcrop of Precipice Sandstone is approximately 100 km from its nearest neighbour, but the intervening areas along the Expedition Range include cliffs of other sandstone formations that may be suitable habitat for *T. taori*.

The largely uninterrupted continuum of suitable habitat, together with the lack of morphological differences in adults from disjunct localities, suggests that genetic isolation has not occurred. It is clear that the extensive lengths of the escarpment on private land play an important role in maintaining connectivity and habitat for this species.

Atkins (1997) listed an unconfirmed sighting of *T. taori* from near Springsure. However, the Minerva Hills area is not sandstone and a search of the Queensland Herbarium database showed no records of *L. c. pallida* from there, suggesting that this sighting should be regarded as doubtful.

Acknowledgements
We thank the Queensland Department of Environment for permits covering areas of National Park included in our study, local Parks and Wildlife staff for their keen interest and support during field studies and the Queensland Herbarium for identification of *Lomandra* species.

References

ATKINS, A.F. 1997. Two new species of *Trapezites* Hübner (Lepidoptera: Hesperiidae: Trapezitinae) from eastern Australia. *Australian Entomologist* **24**(1): 7-26.

BEETSON, J.W. and GRAY, A.R.G. 1993. *The ancient rocks of Carnarvon Gorge.* Department of Mines and Energy, Queensland, Brisbane; 48 pp.

BRABY, M.F. 2000. *Butterflies of Australia: their identification, biology and distribution.* CSIRO Publishing, Collingwood; xx + 976 pp.

HENDERSON, R.J.F. (Ed.) 1997. *Queensland plants: names and distribution.* Queensland Herbarium, Department of Environment, Brisbane; 286 pp.

WARNER, C. 1987. *Exploring Queensland's central highlands.* Charles Warner, Yanderra, NSW; 144 pp.